U. S. DEPARTMENT OF COMMERCE

Technical News Bulletin

of the

National Bureau of Standards

★ *Issued Monthly* ★

Washington ~~September 1944~~ October 1944 Number 330

CONTENTS

	Page
Wet-strength paper for modern war maps	73
Plastic binoculars	74
Antiscatter treatments for glass	74
Commercial Vinsol resin cement	75
Determination of tin in nonferrous metals	75
Machines and methods for testing cordage fibers	75
Calibration of critical flow nozzles for the Heat Exchange Institute	76
Heats of combustion of paraffin hydrocarbons	77
Ionization constant of boric acid	77
Liquid junction potentials	77
Absolute determinations of the electrical units	78
Discussion of safety rules for installation and maintenance of electric supply and communication lines	78
Loading charts for transmission lines	79
New and revised publications issued during September 1944	79
Mimeographed material: Letter Circulars	80
Recent articles by members of the Bureau's staff published in outside journals	80

WET-STRENGTH PAPER FOR MODERN WAR MAPS

An account of the development of the paper for improved war maps, and its manufacture in quantities necessary to meet unprecedented requirements, is a story of accomplishment through cooperative effort. The new paper, which is responsible for the remarkable performance of the maps under all conditions of current combat service, was developed by the Army Map Service in cooperation with the Bureau and with the wholehearted assistance of certain paper manufacturers.

The new paper has greater strength than any previously used for maps, and retains this strength after being soaked with water or oil, or after being trampled in the mud, and subsequently washed with soap and water, or dipped in gasoline. Even when soaking wet, the paper has satisfactory writing and erasing characteristics. In addition, it has good printing properties and meets all the usual requirements of map paper.

The Bureau has had an important role in extending the commercial manufacture of this paper to widely distributed mills and in utilizing different types of raw materials so as to increase production and to meet the rapidly expanding needs of the armed forces. Two difficult problems were involved: (1) It was necessary to bring into production an entirely new type of paper in mills not familiar with its manufacture, and (2) the supply of the special pulp used in this paper as originally developed became extremely short, and it was necessary to employ pulps previously untried for the purpose.

These problems were solved on a production basis by sending an expert from the Bureau to the different mills selected by the Army to receive educational orders. Charles G. Weber, who had been closely identified with all phases of the development and testing work, served as a technical consultant to 11 different mills and worked with the staff of each until a paper meeting all the requirements of the specification was obtained.

The map paper is now being produced in mills distributed from coast to coast and from the Gulf of Mexico to the Canadian border. Moreover, pulps from eastern spruce, southern pine, western hemlock, and the jack pine of the Great Lakes region are used with equal success. The current requirement is well over 10,000,000 pounds per month, and this huge tonnage is being supplied without departure from the original high standard of quality.

[1] Published with approval of the Director of the Budget.

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PLASTIC BINOCULARS

In April 1942 the joint optics committee of the Army-Navy Munitions Board met to consider possible replacement materials for the aluminum used in binocular bodies. The Material Officer of the Naval Observatory recommended that binoculars be fabricated from a plastic material. A development program was initiated at the Naval Observatory in cooperation with the Bureau to obtain a suitable plastic for this purpose and to produce and evaluate the plastic binoculars.

Bodies for the standard 7×50 Navy binocular were molded from a selected group of plastics and assembled into complete binoculars. These were subjected to accelerated service tests, involving exposure to extremes of temperature and relative humidity, and measurements were made of optical and dimensional changes. The binoculars were also subjected to shock and impact tests. The results of these tests indicated that a thermosetting phenolic molding compound, containing a long-fiber asbestos filler, had the necessary strength and dimensional stability for this application.

A special 6×42 binocular design was developed by the Naval Observatory to utilize fully the advantages of the plastic material. This binocular has a field and light-gathering power similar to that of the 7×50 type; weight comparable to that of the 6×30 type; fixed focus and fixed interpupillary distance, eliminating the necessity for axial and eyepiece adjustments; waterproofness at a depth of 100 feet of water; resistance to fungi and corrosion; and an embossed gripping surface imparted during the molding operation, thereby eliminating the necessity for a separate covering material. It is a compact binocular containing a mimimum number of intricate parts, and readily lending itself to mass production. The metal inserts which retain the optical elements are die-cast of a lightweight aluminum-silicon alloy selected because its coefficient of thermal expansion closely approximates that of the phenolic plastic and hence makes negligible the strains arising from differential expansion of the plastic and metal.

Evaluation tests performed on the 6×42 plastic binocular indicate that it satisfactorily fulfills all the requirements for a general-purpose service binocular. Its rugged construction and fixed adjustment features make the plastic binocular exceptionally well suited to specialized service such as night, tropical, amphibious, infiltration, small vessel, and submarine use.

ANTISCATTER TREATMENTS FOR GLASS

The results of an investigation of the effectiveness of various antiscatter treatments for glass, which was sponsored by the Office of Civilian Defense, are reported in Miscellaneous Publication M175, released last month. These treatments are designed to reduce the hazard of flying glass from bomb explosions—a hazard that has been responsible for a large proportion of the air-raid casualties in England.

A vacuum-concussion apparatus was used for evaluating the suitability of the various antiscattering treatments. The glass specimen is clamped as a cover over a tank connected to a vacuum reservoir. The opening of a quick release valve causes a sudden reduction of pressure inside the tank, and the glass is fractured by the air pressure on the outside of the pane. The relative effectiveness of the treatments was judged by the types of failure and the amounts of flying glass.

The treatments which gave promising results in the initial vacuum test were submitted to accelerated-aging tests to ascertain how well they might be expected to retain their desirable properties in service. One test simulated the effect of moisture condensing on windows in cold weather. Another test simulated the drying effects of warm rooms in winter and the heat of the sun in summer.

Lacquers, tapes, and adhesive-fabric materials were found that would maintain satisfactory breaking characteristics after submission to the aging test. An adequate film thickness, at least 0.020-inch, must be applied in the case of the lacquer, and the tape must completely cover the pane in overlapping strips in order to prevent glass from scattering.

It should be recognized that no antiscatter treatment can be considered as giving complete protection from the hazards of flying glass. Laboratory tests and experience in Great Britain have shown that certain treatments will give some measure of protection over part of the area affected by a bomb explosion. However, in or near an area where bombs are liable to fall, individuals should take shelter away from glass-enclosed spaces, even though the glass is covered with an antiscattering material.

Photographs showing the vacuum-concussion apparatus used in this investigation and the characteristic breaks which occurred in the different specimens, and a brief description of the materials and treatments studied, are given in this 31-page report. Copies of M175 can be obtained at 10 cents each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

COMMERCIAL VINSOL RESIN CEMENTS

Concrete pavements have been found more resistant to scaling, to destruction by freezing and thawing, and by action of salt solutions when a small percentage of air is incorporated in the concrete when made. The commercial production of air-entraining portland cement by intergrinding of small quantities of Vinsol resin in the manufacturing process is a rather recent development. The properties of some of these Vinsol resin cements, however, were such that it was impossible to test them according to the existing specifications. New tests were required as well as the development of new testing techniques in order adequately to evaluate the properties of the new material.

The Bureau recently procured 64 commercially manufactured Vinsol resin cements in order to study the water requirements of the pastes and mortars, the quantities of air entrained in the various pastes, mortars and in concrete, and also to make a survey of strengths of the test specimens.

The neat pastes of Vinsol resin cements were stickier than the neat pastes of the untreated cements and also had a tendency to stiffen more rapidly. The cement-sand mortars made of Vinsol resin cements and proportioned according to present Federal specifications were in most cases more plastic than the mortars of the untreated cements. Whereas the neat pastes of Vinsol resin cements required as much or more water than the neat pastes of the untreated cements, the cement-sand mortars usually required less water for the same workability.

Concretes made from the different cements entrained quantities of air ranging from 1 to 14 percent. The air contents of the pastes, the 1 to 3 mortars, and the 1 to 2.75 mortars were not indicative of the air entrained in concrete. Of the various mortars and pastes tested, the 1 to 4 mortar, which has been proposed as a performance test, had the greatest range of air contents with the different cements.

Most of the Vinsol resin cement mortars had both tensile and compressive strengths greatly in excess of specification requirements. A few of the cements, however, failed to meet the 7- and 28-day compressive-strength requirements. The cements had a wide range of strengths at 3 days; for example, tensile strengths were obtained for the different cements ranging from 195 to 465 lb/in.^{2} and compressive strengths ranging from 900 to 3,360 lb/in^2.

DETERMINATION OF TIN IN NONFERROUS METALS

In the analysis of nonferrous alloys, tin is usually determined by titration of a stannous chloride solution with an iodine or iodate solution. This method is subject to a number of limitations. Some of the other constituents in the alloy have an effect on the reaction even when they are present in small amounts. Oxygen dissolved in the solution of oxidant also is said to introduce an error. These errors are usually small and not prohibitive for most commercial work.

A gravimetric method for more accurate work has been developed by William D. Mogerman at the Bureau and will be published as RP1610 in the October Journal of Research. The procedure calls for separation of the tin by distillation, precipitation with cupferron, and ignition to stannic oxide. Results obtained by applying the method to known amounts of high-purity tin and to a number of copper-base and lead-base alloys show that an accuracy to ± 0.2 mg may be expected for amounts of tin ranging from 0.05 to 0.24 g.

MACHINES AND METHODS FOR TESTING CORDAGE FIBERS

Cordage fibers, so essential to military, naval, and civilian purposes, became critical materials soon after the Japanese attack on Pearl Harbor. Every effort had to be made to conserve the available supply, utilize all possible substitutes, develop new sources, and expand the production of the available materials. To effect these measures, machines and procedures for testing cordage fibers in the unprocessed stage were needed for the quick evaluation of the characteristics of experimentally grown fibers and the new native fibers as possible substitutes for abaca (manila), sisal, and jute.

Data concerning the characteristics of fibers long used in the manufacture of rope and cordage were also needed as a basis for judging the suitability of other fibers. These methods and data can be employed in the search for and in the quick development of sources of substitute fibers, and obviate the need of large quantities of fiber that are ordinarily required for test specimens, and that might better be made into rope. The results of this investigation should also aid in the improvement of cordage fibers after the war. They provide means for studying the characteristics of fibers from a single leaf and for conducting systematic and carefully planned experiments.

The development of machines and procedures for testing cordage fibers in the unprocessed stage was undertaken by the Bureau at the request of the Board of Economic Warfare after the Board had consulted experts of the War Production Board and the United States Departments of Agriculture, War, Navy, and Commerce. The proposed study was discussed with experts of the cordage industry. Funds for initiating the investigation were provided by the Defense Supplies Corporation. In addition to the development of machines and testing procedures, the project included tests of standard grades of cordage fibers as well as proposed substitutes.

Machines developed for testing flexural endurance and resistance to abrasion of bundles of cordage fiber are described in a paper by Herbert F. Schiefer in the October Journal of Research (RP1611). In the test for flexural endurance a bundle of fibers having a twist of one turn per inch is repeatedly drawn back and forth over three small pulleys located at the vertices of an isosceles right triangle. In the test for resistance to abrasion, a similarly twisted bundle of fibers is drawn back and forth against a second bundle which is twisted once around the first. This test is made in such a way that the flexing of fibers during the test is reduced to a minimum.

The procedures for selection of fibers, preparation of fiber bundles weighing 5 grains per 15 inches of length, and conditioning of test specimens are outlined. The unprocessed fibers were tested for the following characteristics: Fineness of fiber; dry and wet breaking strength and elongation; effect of elevated temperatures, continuous soaking in fresh and in salt water, alternate wetting and drying by the use of fresh or salt water, and exposure to light with intermittent spraying with water. The results of tests of six lots of abaca, nine of sisal, three of hemp, two of jute, two of henequen, one of pita floja, one of ixtle, four of sansevieria, one of palmetto, three of hemp, two of roselle, one of manzanita, one of malvita, and two of yucca are given and discussed.

Great variations were found in the characteristics of different lots and grades of one kind of fiber, and the results on different kinds frequently overlapped. No one kind of fiber was best in all respects. Abaca was the strongest of the fibers tested, but some of the lots of abaca were weaker than some lots of sisal. Henequen and sisal were more resistant to abrasion than the other fibers, and they had higher flexural endurance, but were the least resistant to exposure to light and intermittent spraying with water. Pita floja, one of the strongest fibers tested, was one of the least resistant to abrasion. Sansevieria had exceptionally good strength. Hemp and jute were very similar in all of the characteristics measured. The resistance to abrasion of all fibers tested was profoundly affected by the direction of twist in the ply relative to that in the bundle, and also by the addition of a small amount of lubricant.

CALIBRATION OF CRITICAL FLOW NOZZLES FOR THE HEAT EXCHANGE INSTITUTE

If the velocity of the jet of air issuing from a nozzle on the end of an air line is increased by increasing the pressure drop across the nozzle, it finally reaches a constant value, above which it does not rise as the pressure drop is increased further. Experiments as well as thermodynamic computations have shown that this limiting velocity is equal to that at which sound will travel in air at the pressure and temperature in the jet, and it is frequently referred to as the "critical" velocity. From this, also, arises the name "critical flow nozzle." However, in order to observe this particular limiting value of the jet velocity, the nozzle should have a smooth, well-rounded entrance and a cylindrical throat section. If the throat section is expanding or if the over-all length is so short that it is more nearly an orifice than a nozzle, the limiting jet velocity will be greater than that of sound.

This characteristic of cylindrical-throated nozzles has often been used as a means of regulating and measuring the

rate of flow of air and other gases. An example is in the testing of steam ejector suction pumps, where such a nozzle is used to determine the rate at which these pumps will remove air from a chamber. In the past, however, there have often been large differences in the results of tests made in different places on the same pump. While these differences may have been due to many causes, it was generally believed that most of them were the result of variations and uncertainties in the sizes and shapes of the nozzles.

In order to obtain greater uniformity in such air-flow measurements, the members of the Heat Exchange Institute have designed a series of 10 nozzles with throat sizes ranging from one-sixteenth to 1 inch in diameter. The specifications for these nozzles placed precision-instrument tolerances on the throat dimensions and entrance contour. They were made of stainless steel (except the largest), and when finished had a smooth, well-polished surface.

Twenty-four sets of these nozzles were made up, and 10 of them, selected at random, were calibrated by Howard S. Bean at the Bureau. The results of these tests were very consistent. At a common rate, the maximum spread between the coefficient curves for any two nozzles was about 1.25 percent, whereas the average spread was about 0.3 to 0.4 percent.

HEATS OF COMBUSTION OF PARAFFIN HYDROCARBONS

In a paper (RP1607) entitled "Heats of Combustion of Eight Normal Paraffin Hydrocarbons," by Edward J. Prosen and Frederick D. Rossini of the Bureau's thermochemical laboratory, which appears in the October number of the Journal of Research, are reported experimental data on the heats of combustion at 25° C of *n*-pentane, *n*-hexane, *n*-heptane, *n*-octane, *n*-nonane, *n*-decane, *n*-dodecane, and *n*-hexadecane. The calorimetric and chemical apparatus and procedure are described in detail. A later paper in the series will utilize these data in the selection of "best" values for the heats of combustion of the normal paraffins and in the calculation of their heats of formation.

IONIZATION CONSTANT OF BORIC ACID

The control of acidity and alkalinity of aqueous solutions has long been recognized as important in the manufacture of numerous commercial products. Industrial processes, such as conditioning of boiler waters, removal of suspended and colloidal particles, the formation and the coagulation of emulsions, extraction of alumina from clays, and the inhibition of bacterial growth depend largely upon pH control. Many of these solutions are alkaline, and uncertainties have entered into the measurement of their pH, because of the lack of reliable alkaline standards.

George G. Manov, Nicholas J. DeLollis, and S. F. Acree, of the Bureau, recommend certain borax-sodium chloride solutions as fixed points for the calibration of the pH scale in the alkaline range over the temperature interval 0° to 60° C. A solution composed of 3.814 g of borax and 1.169 g of sodium chloride in a liter of solution has a pH of 9.155 at 25° C and may be used for checking glass-calomel and other electrometric pH equipment.

The theory of the method, the manner in which the chemicals are purified, and the experimental data are given in the October number of the Journal of Research (RP1609).

LIQUID JUNCTION POTENTIALS

In pH by electrometric methods, such as hydrogen-calomel and glass-calomel assemblies, the neglect of the change in potential across the liquid junction at the reference half-cell when the standardizing buffer is replaced by the unknown solution may give rise, in extreme cases, to errors of several tenths of a pH unit. These potentials are caused by differences in the relative mobilities and concentrations of the positive and negative ions of the electrolytes that form the boundary between the calomel half-cell and the buffer or unknown solutions.

In the October number of the Journal of Research (RP1608), George G. Manov, Nicholas J. DeLollis, and S. F. Acree present the results of experiments made at 25° C on several calomel half-cells, the electrolytes of which contained potassium chloride with small amounts of hydrochloric acid and potassium nitrate, added singly or together. These electrolytes were chosen so as to diminish as much as possible the contribution of the reference electrode to the liquid-junction potential, by making the effective mobilities of the positive and the negative ions more nearly equal.

Data are given for the stability of these cells, the reproductibility of the liquid-junction potential, and the activity coefficient of the chloride ion in these mixtures relative to that of saturated potassium chloride solution at 25° C.

ABSOLUTE DETERMINATIONS OF THE ELECTRICAL UNITS

One of the important events in electrical engineering was the adoption of the international electrical units by the International Electrical Congress held at Chicago in 1893. These units have been universally used since that time. They were intended to form a part of a system of units in which the numbers that represent the proportionality factors in the fundamental equations of the system are powers of 10; such as 1/10, 100, 1000, etc. It seemed desirable at that time to describe methods by which the electrical units could be established in any well-equipped laboratory. As a result, the definition of the international ohm contains a statement concerning the mass and length of the uniform mercury column required to give a resistance of 1 ohm, and that of the international ampere concerning the rate of deposition of silver from a solution of silver nitrate.

In the last half century, so many advances have been made in our technical knowledge and so many changes have taken place in our social structure that new methods of dealing with the electrical units have gradually come into use. An accuracy of 1 part in 1,000 was then considered adequate; now 1 part in 1,000,000 is sometimes important. Then, transportation of these standards was so unsatisfactory and standardizing laboratories so few that almost every important user preferred to be in a position to set up his own standards; now, little difficulty is experienced in transporting standards to and from the standardizing laboratories. So little was then known about the properties of materials that it seemed easy to establish a unit by merely indicating a property to be measured; now, so many variations are known, even in the most fundamental properties of a material, that the establishment of a unit by reference to such a property is in disfavor.

In order to establish the electrical units on a better basis than that on which the present international units rest, measurements have been made on the absolute electrical units in the national standardizing laboratories during the past 10 years. The results obtained in these laboratories differ slightly, which is not surprising considering the very different methods that were employed. An analysis of the results of all absolute determinations in the last decade has been made by Harvey L. Curtis and will be published as RP1606 in the October number of the Journal of Research. He concludes that the unit of resistance (the international ohm) as maintained at the National Bureau of Standards is 494 parts in 1,000,000 larger than the absolute unit, and the unit of voltage (the international volt) is 332 parts in 1,000,000 larger. The values of the other electrical units are readily obtained from these two values. The units maintained at the other national laboratories are approximately the same as those maintained at the Bureau.

DISCUSSION OF SAFETY RULES FOR INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY AND COMMUNICATION LINES

Almost thirty years ago the Bureau, alarmed at the high death rate among electrical workers, particularly those whose duties took them on high-voltage transmission lines, began a study of the causes of electrical accidents. The result was the publication of the first edition of the National Electrical Safety Code. This and subsequent editions have been used as a basis for regulation by many State public utility commissions and similar bodies. The fifth edition, recently published, was prepared as a series of separate handbooks (NBS Handbooks H31 to H36, inclusive). Handbook H32, "Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines," comprising Part 2 and the grounding rules of the fifth edition of the Code, covers perhaps the most hazardous part of the electrical industry—the transmission of power and communications on overhead and underground lines.

The discussion of part 2 has just been made available as Handbook H39. It considers in detail these rules and methods of complying with them. Transmission and communication lines are required to be so constructed that they will not only offer a minimum hazard to linemen but will not, under any ordinarily anticipated condition, be a hazard to the public.

Ice storms are a common cause of failure. Because such storms are much more prevalent and do more damage in some locations than in others, the country has been divided into three loading districts, areas where severe, medium, and light ice and wind loadings may be expected. The "loading map" was prepared only after a thorough study of weather reports and of the actual storm experience of many large power and

communication companies. The boundaries of the light-, medium-, and heavy-loading districts are given in the discussion.

The effect of the stretch of conductors as the result of ice and wind load, and also the method of computing the "final unload sag," which takes into account the permanent stretch brought about by such loads, are discussed.

Strength requirements for poles and towers, conductors, insulators, crossarms, and other line equipment are considered, as are the requirements for underground line construction. The recent completion of coast-to-coast underground telephone lines, and the almost universal use of underground distribution systems for power in large cities, makes this section on underground construction of ever-increasing importance.

The many tables of conductor strengths, maximum sag increase, pole data, and similar material make this volume of particular value to engineers charged with the design and maintenance of power and communication lines. Copies of H39 are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The price is 75 cents, with buckram binding.

LOADING CHARTS FOR TRANSMISSION LINES

A series of three charts dealing with the loading of electrical transmission lines is reproduced in the discussion of the National Electrical Safety Code, Handbook H39 (see preceding item). As they appear in the Handbook, these charts have been reduced to approximately one-third of their original size. Although it is possible to make reasonably accurate determinations from these small cuts, they are not satisfactory for regular use. Therefore, at the suggestion of several organizations and in compliance with requests from power and communication companies and from railroad signal engineers, it was decided to publish a set of full-size charts, and these are now available as Miscellaneous Publication M176. The use of these larger charts will permit rapid and accurate determination of values and should save time in laying out new lines or when increasing the number of conductors on existing poles or towers.

Chart 1 consists of two conductor loading nomographs from which, when the vertical and transverse wind loadings are given, the total conductor loading may be obtained. Chart 2 gives: (A) Bending moments due to wind on a pole; and (B) ultimate resisting moments of wood poles.

Chart 3 is the catenary curve giving values of the sag at points on the curve expressed in percent of the center sag.

Copies of M176 (the set of five charts) are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The price is 25 cents.

NEW AND REVISED PUBLICATIONS ISSUED DURING SEPTEMBER 1944

Journal of Research[2]

Journal of Research of the National Bureau of Standards, volume 33, number 2, August 1944 (RP1597 to RP1601, inclusive). Price 30 cents. Annual subscription, 12 issues, $3.50.

Research Papers[2]

[Reprints from the July and August 1944 Journal of Research]

RP1592. Thermodynamic properties of *cis*-2-butene from 15° to 1500° K. Russel B. Scott, W. Julian Ferguson, and Ferdinand G. Brickwedde. Price 10 cents.

RP1594. Synthesis of vitamin C from pectic substances. Horace S. Isbell. Price 10 cents.

RP1595. Specific heat and increases of entropy and enthalpy of the synthetic rubber GR–S from 0° to 330° K. Robert D. Rands, Jr., W. Julian Ferguson, and John L. Prather. Price 5 cents.

RP1596. Dipole moment and structure of trioxane. Arthur A. Maryott and S. F. Acree. Price 5 cents.

RP1600. A physical method for determining residual water and other volatile materials in pure substances. Frank W. Schwab and Edward Wichers. Price 5 cents.

RP1601. Optical rotation as an indication of aromatic substituent influences and intramolecular interaction. William Ward Pigman. Price 5 cents.

Handbook[2]

H39. Discussion of the National Electrical Safety Code—Part 2 and grounding rules. Price 75 cents.

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[2] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Subscription to Technical News Bulletin, 50 cents a year; Journal of Research, $3.50 a year (to addresses in the United States and its possessions and in countries extending the franking privilege); other countries, 70 cents and $4.50, respectively.

Simplified Practice Recommendation [2]

R108–44. Dental hypodermic needles. (Supersedes R108–43.) Price 5 cents.

Miscellaneous Publication [2]

M175. Antiscatter treatments for glass. Frank W. Reinhart, Ruth A. Kronstadt, and Gordon M. Kline. Price 10 cents.

M176. Nomographs and charts for transmission lines. John A. Dickinson. Price 25 cents.

Technical News Bulletin [2]

Technical News Bulletin No. 329, September 1944. Price 5 cents. Annual subscription, 50 cents.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having a definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

LC762. Whiteware: Publications by the staff of the National Bureau of Standards. (Supersedes LC587–A.)

LC763. Solid carbon dioxide. (Dry ice) (Supersedes LC420.)

LC764. The care of floors. (Supersedes LC627.)

LC765. Floor oils. (Supersedes LC339.)

LC766. Modern books on horology. (Supersedes LC668.)

RECENT ARTICLES BY MEMBERS OF THE BUREAU'S STAFF PUBLISHED IN OUTSIDE JOURNALS [3]

Signaling with mirror. R. S. Hunter. Air Sea Rescue Bulletin (Air Sea Rescue Agency, 1516 14th St., NW., Washington, D. C.) p. 6 (July 1944) (Restricted).

Methods and standards for gloss measurements of camouflage materials. R. S. Hunter. Metal Finishing (11 West 42d St., New York 18, N. Y.) 42, 519 (August 1944).

A method of preparing paint films for determining their contrast ratio. Paul T. Howard. Nat. Paint, Varnish & Lacquer Assn., Scientific Section (Washington, D. C.) Circular 695, 8 pages (Sept. 1944).

Effect of curvature on strength of axially loaded sheet-stringer panels. Walter Ramberg, Samuel Levy, and Kenneth L. Fienup. NACA Technical Note No. 944 (Natl. Advisory Committee for Aeronautics, Washington 25, D. C.) (August 1944) (Restricted).

Standardization of package forms. William E. Braithwaite. Packaging Catalog for 1944 (Packaging Catalog Corp., 122 E. 42d St., New York, N. Y.) p. 66 (August 1944).

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[3] These publications are not obtainable from the Government unless otherwise stated. Requests should be sent direct to the publishers.

U. S. GOVERNMENT PRINTING OFFICE: 1944